THE IMPACT OF SELECTED STATE AND FEDERAL LAND USE REGULATIONS ON MARTIN COUNTY, FLORIDA, BEACHES

By

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The purpose of this study is to determine the impact of two selected state and federal regulations on the Atlantic beachfront of Martin County, Florida. The regulations selected were the National Flood Insurance Program and the State of Florida Coastal Construction Control Line. They were chosen because they represent two types of land use regulation. The National Flood Insurance Program represents regulations which provide inducements to achieve the desired land use patterns. Florida's Coastal Construction Control Line represents regulations which exert direct control over land uses.

Each regulation was examined for the legislative objectives precipitating the laws. The impact of each law was determined and compared with the respective objectives of the legislation.

The National Flood Insurance Program was found not to have induced the State of Florida or Martin County local governments to

enact additional flood plain legislation. The Program also was found to increase the financing available for Martin County beachfront property. Finally, the Program was not found to have decreased development along the coastal flood plain. Each of these findings was in direct conflict with the stated legislative objectives.

Florida's Coastal Construction Control Line was found to have a net cost to public and private sectors. The implementation of the legislation was found not to have decreased the public expense of beachfront development.

CHAPTER I

INTRODUCTION

Beginning with the first major comprehensive zoning ordinance enacted in New York City in 1916, our nation has witnessed increasing land use regulation. While this regulation was at first primarily confined to urban places, in the last two decades this type of regulation has spread to the most remote areas, as evidenced by the Wild and Scenic Rivers Act of 1968. Initially, this regulation was promulgated by local governing bodies in the form of zoning laws; but now, land use is also strongly affected by the federal government. This may be seen in the National Environmental Policy Act, the Clean Air Act of 1970, the Federal Water Pollution Control Act Ammendments of 1972, the Coastal Zone Management Act of 1972, and many others.

At the state and federal levels, land use regulation has been accomplished by two major vehicles--direct regulation and "carrot and stick" regulation. Examples of direct regulation are the federal government's Wild and Scenic Rivers Act of 1978 and Florida's Beach and Shore Preservation Act. A good example of "carrot and stick" regulation is the National Flood Insurance Act of 1968. The Federal Flood Insurance Act of 1968 promises subsidized flood insurance (the "carrot") for those communities which will enact acceptable flood plain land use regulation. The "stick" in this act is the threat of federal intervention in real property financing and the restriction of federal disaster relief for those communities which do not partake of the "carrot".

This study examines one aspect of the more recent areas of land use regulation, that of coastal zone land use management. It addresses the general question of land use regulation and its relation to coastal zone land use management, along with a close examination of how two specific regulations impact a specific county. The regulations chosen for close examination are the State of Florida's Beach and Shore Preservation Act[1] and the Federal Flood Insurance Act of 1968. These regulations were studied for their impact on Martin County, Florida's, Atlantic beaches, and how well these regulations achieve their legislative intent.

Statement of the Problem

Governments at all levels have finally realized the public value of sandy coastal beaches. This public value is derived from three primary sources: 1) storm protection benefits to more landward areas, 2) public recreation benefits, and 3) an increased tax base from the high prices of beachfront properties. Unfortunately, as the tax base is enriched through coastal development, there has been a directly related reduction in public storm protection and recreational benefits in many areas. In some areas, such as Bay County coastal beaches, development has even imposed a substantial public cost, as witnessed immediately after Hurricane Eloise (Shows, 1976). Examination of early local land use regulations in areas such as Jacksonville Beach, Miami Beach, and Daytona Beach indicates the apparent lack of concern for any considerations beyond traditional zoning other than an increase in the tax base through development of the coastal beaches.

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1. Specifically the provisions regarding the Coastal Construction Control Line - formerly the Coastal Construction Setback Line.

As a reaction to the lack of sufficient private, or local government control in areas such as these, the federal government and several coastal states have enacted legislation exerting limited direct or indirect regulation over the coastal areas through the vehicles mentioned previously. Unfortunately, the promulgation of state and federal land use regulations may be made by persons unfamiliar with local problems. The prevailing legislative psychology seems to assume that because there is irresponsible land use in some areas, laws must be passed to restrain such irresponsible use in all areas. While on the surface this legislative perspective is quite noble, the actual legislation forthcoming restricts specific uses of land, rather than restricting the damage such use might cause.

A common example of such a legislative perspective is found in many flood plain land use regulations such as in Charlotte, North Carolina. These regulations prohibit construction of any major structure within the one-hundred year flood plain. The legislative objective of such a regulation is to prevent construction of new structures which would result in increased flood damage not just to the new structures, but also to the other structures in the flood plain. The increase in damage to the other structures in the flood plain would result whenever the new structures impeded the flow of the flood waters thus causing an increase in the height of the flood surge. Such regulations do prevent the undesirable construction but they also prevent compatible development. The legislative objectives could also be achieved through allowing any development in the flood plain which would be only nominally damaged in the event of a flood and which would not significantly impede the flow of flood waters (FIA, 1977).

This legislative philosophy of restricting specific land uses may be seen in the objectives of the National Flood Insurance Act of 1978 (USDHUD, 1974). These objectives are to "(1) encourage state and local governments to make appropriate land use adjustments to constrict the development of land which is exposed to flood damage and minimize damage caused by flood losses, (2) guide the development of proposed future construction, where practicable, away from locations which are threatened by flood hazards, [and] (3) encourage lending and credit institutions, as a matter of national policy, to assist in furthering the objectives of the flood insurance program . . ."

The intent of the State of Florida Beach and Shore Preservation Act's Coastal Construction Control Line (CCCL) is to (1) discourage development seaward of a building line determined by state engineers and (2) rigidly regulate the structural design, siting, and materials for construction seaward of the building line. The objective of the CCCL is to reduce the expenses of maintaining the State's beaches through control of coastal development, erosion, and storm damage.

The question addressed by this study is: Are the objectives of the Federal Flood Insurance Program[2] and the Coastal Construction Control Line being achieved in Martin County? This research indicates that the objectives of these programs have not been achieved in Martin County. Also suggested by this study are some probable reasons for failure and some possible alternative approaches to the problem.

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2. Created in the National Flood Insurance Act of 1965.

Design

The design of this study consists of three steps. First, the impact of the National Flood Insurance Program was determined. Second, the costs and benefits of the Coastal Construction Control Line were estimated. Third, these results were compared with the goals and objectives stated in their respective legislative acts.

The impact of the National Flood Insurance Program was assessed using a three part procedure. Each part of the procedure was designed to measure the impact on Martin County for each objective of the National Flood Insurance Program.

The first objective of the National Flood Insurance Program was to encourage "appropriate" state and local land use regulation in flood susceptible areas. The first part of the impact assessment procedure was to examine state and local land use regulations for significant changes in land use policy for Martin County. Specifically examined were any laws enacted subsequent to implementation of the National Flood Insurance Program which would "constrict the development" of beach-front property.

The second objective of the National Flood Insurance Program was to guide future development away from flood prone areas. The second part of the impact assessment procedure was to determine the historic land use pattern prior to implementation of the program. This historic pattern was then projected and compared with the current land use pattern for significant differences.

The third objective of the National Flood Insurance Program was to encourage lending and credit institutions not to make loans in flood-prone areas. The last part of the impact assessment procedure was to

survey area lenders to determine whether there had been a change in lending policy for property on the coast after implementation of the program.

The costs and benefits of the Coastal Construction Control Line were assessed assuming that without the CCCL development patterns would have consistently continued in accordance with historic trends. The costs estimated were (1) administrative costs, (2) variance procedure costs, and (3) changes in property values, and consequently, changes in the tax base. The potential benefits estimated result from (1) storm damage reduction, and (2) additional recreation through increased open space. These costs and benefits were determined for all privately held ocean front properties.

The costs and benefits accruing since implementation of the Coastal Construction Control Line were estimated to determine the current success of the legislation in reducing coastal zone management expenses. Future costs and benefits were also predicted using 10, 20 and 50 year projections. These projections were examined to determine the expected future success in reducing coastal zone management expenses.

Excluded from this analysis were all publically owned properties. These were excluded primarily for two reasons. First, because of their greater resources, the government was presumed to be more aware of the total impact of development of such properties than the private sector. Therefore public development is expected to proceed in such a manner as to optimize the public welfare. Second, the regulations studied were primarily designed to regulate the private sector.

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of the literature pertaining to coastal zone land use management is presented in two parts. First, the rationale for coastal zone land use management is examined from its historic perspective, its economic perspective, and its Constitutional basis. Second, the history of state and federal regulation relating to the National Flood Insurance Program and Florida's Coastal Construction Control Line is presented.

Rationale for Coastal Zone Land Use Regulation

Much of the development along the coastline of the United States prior to the late 1960's removed part or all of the sand dune systems at the development sites. There was little evident concern with the consequences of such development procedures. This absence of concern can be largely attributed to the lack of understanding of the protective role of the dune system (USACERC, 1964). Without the sand reserve of the dune system to absorb the impact of a storm, even structures quite a distance from mean high water would be exposed to severe storm threat. With the sand reserve, however, even structures just landward of the dunes are relatively safe.

The economic theory of coastal zone land use management is centered largely around the existence of an optimal building line along the beach-front (Shows, 1976). For both the public and private sectors of our economy, construction upon the optimal building line will maximize the total benefits net of all costs. The theory further states that

without land use regulation, the private sector will build at non-optimal points. The reason suggested by the theory is that the components and their respective weights of the optimizing function differ.

For example, consider only the impact of an expected hurricane on a new condominium. For both the public and private sectors the expected loss on a specific structure from a hurricane may be represented by the following equation.

$$E(L) = \sum_{i=1}^{n} (v \cdot p \cdot d_i)$$

$E(L)$ = expected loss

n = number of years

p = probability of hurricane during any one year

v = property loss during a hurricane

d_i = discount factor for year i

The equation assumes that the public's wealth is comprised of the sum of all private wealth. This assumption is necessary to show that in the event of hurricane damage, both the individual owning the condominium and the public suffer the loss. (Actually the public sector also incurs other losses such as debris removal, tax base loss, and income tax revenue loss. These are discussed in Chapter 5.)

Of the three major participants in this scenario, the developer has by far the lowest expected loss. The reason is twofold. First, the expected holding period (n) for the developer is very short. Second, the discount rate applicable to the developer is usually much higher. The cost of public capital may be estimated at either the interest rate payable for the general public's savings account or the

interest rate charged government for borrowing funds in the money markets. The cost of the developer's capital may be estimated at either his average rate of return on his other developments or his borrowing rate from commercial lenders. Since most of the major components of a discount rate are reflected by the cost of capital, the developer also has a much higher discount rate than the public.

The amount of property loss during a hurricane has been shown to be a direct function of the distance to the mean high water mark (Shows, 1976). Assuming that some marginal benefit of construction closer to the water exists, the developer will tend to choose a construction point closer to the water than the construction point which might be chosen by the public. This is expected because he has a lower expected storm loss than the public for any given distance from the mean high water mark.

It may be argued that the developer in the long run will not build seaward of the society optimal building line, as his clients will discount the price they would pay because of the higher expected loss. This argument has two fallacies. First, the potential buyers will probably reason that the developer would choose a "safe" building line. Since they do not likely have the same technical assistance such as an engineer or architect available to them as had the developer, the buyers will tend to rely upon the developer's judgement. The second fallacy is that the buyer's holding period is probably only a few years longer than the developer's. Even if buyers accurately perceive the higher loss rate, the discount that they would apply to the purchase price would be relatively small in comparison to the expected loss to

the public, which would have a holding period approximately equal to the useful economic life of the structure.

The costs and benefits considered when determining the optimal building point for an individual structure include the aesthetic view from the proposed structure, personal transporation costs to the water-front, privacy offered for the public portion of the beach, and storm damage costs.

The amount of each individual cost or benefit is generally related to the distance from the structure to the ocean in the following manners:

The view benefits = $f\left(\frac{1}{\text{distance}}\right)$

Personal transportation costs = $f\left(\frac{1}{\text{distance}}\right)$

Privacy benefits = $f(\text{distance})$

Storm damage costs = $f\left(\frac{1}{\text{distance}}\right)$

Unfortunately these functions are usually not continuous within the relative range of optimality consideration. This is due to the existence of the primary and secondary dune systems. Behind these dune systems additional cost of increasing the heights of structures must be incurred to obtain a favorable view over the dunes. Personal transportation costs greatly increase once landward of the dune systems. Again, additional costs of a walkway over the dunes must be incurred to bring the transportation costs in line with the initial transportation cost function. However, privacy benefits are greatly increased landward of the dune system. Storm damage costs are even more greatly reduced landward of the dune system.

Since prices fluctuate differently throughout our economy, the optimal building line must also fluctuate. Since natural systems also fluctuate, the optimal building line must fluctuate even more. For example, if the erosion occurs, reducing the distance between the structure and the water, the expected structural damage from a hurricane increases. All other conditions held constant, the optimal building line would then recede landwards. If, on the other hand, building costs fall and other conditions hold constant, the optimal building line would then move further seaward. Due to the great complexity of these problems and relatively restricted resources of the private sector, the government has decided that it can more efficiently determine the optimal building line.

Basic Constitutional Issues

The United States Constitution places certain restrictions on the public regulation of private lands. These restrictions include limitations on the taking of private lands by the public, the rights of private citizens to the due process of law, the right of private citizens to be treated equally under the law, and the right of private citizens to travel and live in any public community within the United States of America.

The basic Constitutional issues regarding public regulation of private lands center around the Constitutional interpretation of these restrictions by the courts. The principal importance of these Constitutional issues is the distinction between the exercise of the police power for land use regulation and the exercise of the power of eminent domain. If, after examining the circumstances surrounding a specific case, the courts decide a particular regulation is the

exercise of the power of eminent domain, equitable compensation must be paid to the land owner if the government wishes to continue the same restriction on the property in question. If, however, the court decides that the particular regulation is the exercise of the police power, no compensation is paid to the land owner regardless of the severity of the financial damage he may have sustained. In effect, the judicial decision of whether or not a specific land use regulation violates a Constitutional restriction results in an "either/or dilemma" for the judiciary. This dilemma forces the judiciary to rule without any regard to equity for either party to the dispute (Costonis, 1977).

Under the exercise of the police power, the government may promulgate regulations which promote the public health, safety, morals, and welfare. The major Constitutional issues involved with the exercise of the police involve interpretations of whether there is a violation of the rights of due process, equal protection, and free travel, as well as the more fundamental issue of when the exercise of the police power actually is constructive condemnation and therefore actually the exercise of eminent domain.

The question of whether regulations violate the due process clause of the Constitution centers around two issues. First, the regulations must not deny an individual any procedural rights found elsewhere in the law such as regulations which constructively condemn an individual's property and deny him the normal procedural rights to compensation after condemnation. The second issue regarding due process involves the question of whether due process was followed in the making of the regulation. Here, the courts are concerned because the regulation must have a reasonable relationship between the goal sought by

regulation and the regulation itself. In the opinion by Justice Sutherland, citing Radice v. New York (264U.S.292,294), he applied a standard of a "fairly debatable" relationship between the regulation and improving the public's welfare and interest (Village of Euclid v. Amber Reality Co., 272U.W.365,47 Sup.Ct. 114,71L ed.303 (1926)).

A great many land use regulations are defeated in court because they violate the "equal protection" clause of the Constitution. These cases may be broadly classified in three categories. The first involves those cases whereby a specific land use regulation arbitrarily treats some land owners differently from others in the community. This is seen in what has been frequently called "spot zoning." Another example may be found in the Pounds v. Darling decision (77 So.666,668). In this case, a city ordinance forbidding bathing in a lake, which was the city's water supply, was stricken because it usurped the riparian rights of lake-front property owners.

The second category of land use regulations which were found to deny equal protection are those which involve exclusionary zoning. In its decision on the zoning ordinance of Mount Laurel, New Jersey, which only allowed single-family residential development, the court struck down the ordinace saying ". . . Mount Laurel must, by its land regulations make realistically possible the opportunity for an appropraite variety and choice of housing for all categories of people who may desire to live there . . ." (Southern Burlington County N.A.A.C.P. v. Township of Mount Laurel, 67N.J. 151,336 A 2d 713 (1975)). Ironically in 1974, the court upheld a similar zoning ordinance

(Village of Belle Terre v. Boraas, 416U.S.1,6ERC 1417) on the grounds that the ordinance was consistant with its legislative objective of ". . .A quiet place where yards are wide, people few, . . ."

The third category of land use regulations which were found to deny equal protection are those which involve the restriction of free travel. The right to travel is allegedly infringed when the legislation attempts to suppress growth in a community, thereby suppressing the ability of people to move into the community. Examples of communities in which such regulations have been enacted are Boca Raton, Florida; Ramapo, New York; and Petaluma, California. When such regulations are clearly tied to the physical and economic capacity of an area to maintain the population in a healthful and safe manner, the right to travel may be suppressed in favor of these other objectives.

Unfortunately it is not clear what will happen when the restricted growth regulation is not clearly tied to the physical and economic capacity of an area. In the Petaluma, California case, the growth restrictions were not tied to the holding capacity of the area. The Federal District Court struck down the regulations in 1974 on the basis that the regulation interfered with the public right to free travel (Construction Industry Association of Sonoma County v. City of Petaluma, 375 F.Supp. 574,6ERC 1453). Unfortunately, the decision is not reliable as a landmark case on the right to travel. In 1975, the U.S. Court of Appeals for the Ninth Circuit reversed the district court's decision on the basis that the Construction Industry Association of Sonoma County did not have the standing to sue with the grounds of obstruction of the right to travel, since the members already lived in the county and were obviously not prevented from entering. The court

went on to rule that the association was really trying to represent some potential citizens of the community (F 2d 897,8ERC 1001). In February 1976, the Supreme Court apparently agreed with the Court of Appeals when it refused to hear the case (96 S. Ct 1148).

The Constitutional issue of when the exercise of the police power is really constructive condemnation is a very complex one. The courts have generally relied on four basic theories to make the distinction between exercise of the police power and a taking of the property through constructive condemnation (NRDC, 1977).

The first theory used to distinguish between a taking and exercise of the police power states that regulations which attempt to prevent land uses which have unacceptable external costs will be considered an exercise of the police power. This theory has as its origin early English Common Law — a person may not use his property to injure another. Since its judicial introduction in the 1800's, the courts have relied upon this theory many times to uphold various land use regulations. Modern examples of such regulation include many of the wetlands protection laws and the sand dune preservation laws.

The second theory states that regulations which attempt to achieve a public benefit rather than prevent a public harm are really a taking of property rather than an exercise of the police power. Many coastal land use regulations promulgated in recent years have had as a goal suppression of beach-front development so that open spaces along the coast might be preserved. Some of these regulations have been overturned, since the public could not show how development contrary

to the regulation would damage the public interest. In Zable v. Pinellas County Water and Naval Construction Authority (171 So2d. 376), the court held that to deny a permit to bulkhead and fill submerged land would be taking the land without paying just compensation. The court noted that there had been no convincing evidence to show that the filling of the land would cause a public harm. For similar reasons, the Fourth District Court of Appeals in Palm Beach County v. Vaughn et al. (295 So.2d. 383) upheld a lower court decision which struck down for the property in question a county ordinance requiring a 25 foot setback behind the dune crest line along the Atlantic beaches.

The third theory states that when the value of the property is so severely diminished by implementation of a regulation, a taking has occurred. A study performed in 1963 indicated that when the value of a property decreases by two-thirds due to imposition of a land use control, the courts will tend to rule that a taking has occurred (Krasnowiecki, 1963). The evidence, unfortunately, is not clear on this point. In a 1915 decision on Hadacheck v. Sebastian (239 U.S. 394), the United States Supreme Court upheld a regulation where the value of the property was reduced 92.5 percent. In Forde v. City of Miami Beach, the Florida Supreme Court stated that a regulation was constructive condemnation when it "...has the effect of completely depriving them (the property owners) of the beneficial use of their property. . ." In City of Clearwater v. College Properties Supra (239 SO. 21515), the court ruled that zoning of a property must be changed because there was no current demand for the use of the property as it was zoned at the time of the case.

The fourth theory which the courts use to distinguish between a taking and exercise of the police power involves weighting the damage to the public by adverse land use of a property against the damage to the owner if such land use is prohibited. In striking down an ordinance which prohibited construction near existing structures during the tourist season, the Florida Supreme Court in Town of Bay Harbor Island v. Schlapik (57 SO. 2d. 855) ruled that the harm to the owner exceeded the "benefits redounding to the public" and sustained a lower court's ruling in the case against the ordinance.

The National Flood Insurance Program

Prior to the Flood Control Act of 1936, federal involvement in flood control was primarily restricted to relatively small Mississippi River projects by the United States Army Corps of Engineers. The Flood Control Act of 1936, however, created the Tennessee Valley Authority (TVA) which was charged with structural large scale flood control measures, such as dam and reservoir construction.

For the next twenty years, government spending for structural flood control steadily grew. Alarmingly, however, during the same period, flood losses grew exponentially. Ironically, the primary reason for this growth in flood losses was the structural flood control measures. When there had been a structural flood control measure at a particular point along a waterway, people perceiving less risk from flooding began large-scale flood plain development. Then when a flood occurred which exceeded the design capacity of the structural flood control measure, huge damage resulted. Consequently, public disaster assistance and subsidiaries also grew exponentially.

In an effort to curb the huge public costs of disaster relief, the Federal Flood Insurance Act of 1956 was passed. Funding for the Act was not granted at the time of the law's passage, and many subsequent attempts at funding also failed. As a result of the inability to fund the program, the South Eastern Hurricane Disaster Act of 1965 included a requirement for a flood insurance feasibility study.

The next year Congress was presented House Document 465[3]. In this document, the vicious cycle of flooding, damage, flood control projects, increased flood plain development, more flooding, more damage, and more projects, was recognized. In transmitting this document to the Congress, the President stated, "The key to the problem lies, above all else, in the intelligent planning for the State and local regulation of lands exposed to flood hazard." (Kleppe, 1976). At the same time, the President issued Executive Order 11296 which mandated that federal agencies evaluate flood hazards prior to funding the construction of any public building or the purchase of any public lands. This was the first major non-structural attempt at flood loss control.

Two years later, Congress repealed the Federal Flood Insurance Act of 1956 and passed the National Flood Insurance Act of 1968. This act provided for the purchase of subsidized flood insurance by owners of property in flood plains. Flood insurance was available

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3. Task Force on Federal Flood Control Policy, A Unified National Program for Managing Flood Losses, House Document # 465, 89th Congress, Second Session, 1966.

subject to the local community's beginning appropriate flood plain land use management. Very few of the estimated 22,000 eligible communities accepted the subsidized flood insurance "carrot" during the first five years of the program. Consequently, Congress enacted the Federal Disaster Protection Act of 1973. This legislation amended the National Flood Insurance Act of 1968 and gave it a "stick" with which to encourage participation. This "stick" was very large indeed; it allowed the government to withhold disaster assistance loans and grants to a community hit by a flood disaster if the community did not participate in the federal flood insurance program. The "stick" also had a large nail at its end. It allowed the government to forbid any federally assisted lending institution (effectively almost all lenders) from making any loans in a flood plain of a nonparticipating community.

Since the enactment of the amendments, community participation has grown. Consequently, the impact of the Flood Insurance Program has become more visable. In a study of three Rhode Island coastal communities (Miller, 1975), the Flood Insurance Program was shown to have some serious adverse impacts.

First and most dramatic, the study indicated that the program increased demand for ocean-front property. This result was in direct conflict with the stated objective of reducing flood plain construction. The study attributed the increase in demand for coastal property to the dramatic increase of loan funds for those properties.

Prior to the implementation of the National Flood Insurance Program, funds for the purchase of beach-front homes were obtained from primarily two sources: 1) owner equity funds and 2) new mortgages on properties other than the beach property, such as refinancing of the owner's primary residence. Very few mortgages were placed directly on the beach properties due to the risk of storm damage. With implementation of the Flood Insurance Program, however, banks could lend in the coastal plain as long as the owner obtained and maintained flood insurance on at least the outstanding balance of the loan.

Because of this increased availability of financing for ocean-front property and the resultant increase in demand for the property, prices of the properties have risen higher than otherwise possible. As the prices increase, government must be more cautious with the enforcement of any regulations which cause a decrease in property values since the regulations may be found to be constructive condemnation. The National Flood Insurance Program may also inhibit the ability of government to purchase land through condemnation when prices are elevated. The program may additionally stabilize prices at much higher levels after severe storm damage and may further inhibit the government from purchasing land. This result would be ironic in the light of a study committee formed by the Federal Insurance Administration to examine the possibility of asking Congress for funds to purchase beach-front properties which have just been devastated by a storm (Lynch, 1973).

Another potentially adverse impact of the National Flood Insurance Program was found to be a change in the quality of construction in the coastal flood plain. Prior to the program, most construction was inexpensive woodframe, "tarpaper shacks." After implementation of the Flood Insurance Program, new construction in the coastal flood plain shifted toward more costly, higher quality concrete structures. Not only did this shift increase the dollar base for potential storm damage, but it also increased the probable proportional damage level for the new structures. While concrete may on the surface appear to resist storm attack better than wood, the opposite is really true. Concrete is a very rigid material and will not yield before cracking under stress, while wood is quite flexible and can withstand more stress. In order to make concrete construction suitable for coastal areas, lateral and vertical reinforcement is recommended (Collier et al., 1977). In the study of the three Rhode Island communities, such reinforcement was apparently not the customary practice.

Another possible problem with the Flood Insurance Program is the unknown extent of government subsidy for the purchase of flood insurance in coastal areas. Because of the scarcity of actuarial experiences in coastal storm damage, insurance premiums are mainly based upon riverine flood experiences. The Federal Insurance Administration (FIA) does make an adjustment to the premium for coastal and other high hazard areas. This adjustment, however, is purely arbitrary. To further compound the problem, the FIA bases its rates on the one-hundred year flood plain. This may be more reasonable

for riverine flooding situtations, but in coastal areas the actual height that the water reaches may be many feet above the flood plain elevation, due to wave run up. The wave action further complicates the expected damage computations as the foundations undergo a more severe attack than in riverine flooding. An estimate of the government subsidy by the Flood Insurance Program in coastal areas has been estimated to be between 50-85 percent (Shows, 1976).

A final adverse impact demonstrated in case after case is the rebuilding of a storm damaged home in the same high risk location. An example of such an impact is the case of John Knapp (Lynch, 1978). He was expected to rebuild his beach-front home for the second time, again using federal money after his home was destroyed in 1978. He had already rebuilt the home using proceeds from federal flood insurance after another devastating storm in 1972.

Coastal Construction Control Line

In response to the growing erosion costs from development practices which aggravated beach erosion problems, the 1971 Florida Legislature passed the Beach and Shore Preservation Act. As with any public law, its basis was the expectation that the benefits of the implementation of the law would exceed the costs.

The law requires a study of the local conditions of each coastal county before establishing a preliminary Coastal Construction Control Line (CCCL). In the process of determining the preliminary line, the following local beach-front characteristics are examined:

1. Ground elevation in relation to historial storm and hurricane tides.
2. Predicted maximum wave uprush.

3. Beach and offshore ground contours.

4. The vegetation line.

5. Erosion trends.

6. The dune buff line.

7. Existing upland development. (Collier, et al., 1977)

After the preliminary CCCL is determined, the Department of Natural Resources (DNR), which is charged with administration of the law, must hold public hearings in each county. The input from all interested parties must then be considered prior to establishment of the permanent CCCL.

Once the CCCL is established, any construction seaward of the line is prohibited without requesting a special variance from the Department of Natural Resources. The variance provision gives the DNR power to rigidly regulate the design, siting, and materials used in construction seaward of the line, thereby insuring construction compatible with the natural beach system and reducing potential storm damage. The law includes the variance procedure so as not to cause undue hardships upon the landowners by not allowing any seaward construction. This varience provision may also protect the law against Constitutional challenge on excessive hardship — limited public benefit grounds. It is interesting to note that one special ground for which a landowner may be granted a variance is that his immediate neighbors have already built seaward of the line. This special provision may prevent many challenges to the law on the basis that it violates the "equal protection" clause of the Constitution.

CHAPTER III

THE MARTIN COUNTY COASTAL ECOSYSTEM

The Shoreline

Martin County has approximately 22 miles of ocean shoreline which, like much of Florida's Atlantic Coast, consists of barrier islands separated from the mainland by a chain of canals, tidal ponds, lakes, and bays. In particular, the Martin County shoreline consists of portions of two barrier islands separated by the St. Lucie Inlet: the portion of Hutchinson Island south of St. Lucie County, which is about seven miles of shoreline; and the portion of Jupiter Island north of Palm Beach County, which is about fourteen miles of shoreline.

The northern island, Hutchinson Island, is narrow and low in elevation, ranging in width from approximately two hundred feet to nearly four thousand feet. It ranges in elevation from sea level to approximately fifteen feet. The Atlantic coastal sand dune ridgeline along Hutchinson Island varies in elevation from a low of about five feet to a high of about fifteen feet above mean sea level.

The northern portion of Jupiter Island is much like Hutchinson Island, low and flat. However, the southern portion of the island has a sand dune ridgeline along the Atlantic coastline with an average elevation of almost twenty feet, which in some instances reaches elevations greater than twenty-four feet. The island varies in width from a few hundred feet to nearly a mile, with a range in elevation for

the sand dune ridge from about five feet in the north to about twenty-four feet in the southern part of the island.

The Beaches

The beaches in Martin County are composed of fine sand and shell fragments and, in some places, exposed coquina rock. The coquina rock, along with the shifting sand bars offshore, tend to retard erosion and to reduce the intensity of wave action on the shore. This effect is particularly evident in the central and southern portions of Jupiter Island where erosion has occurred at a slower rate than in other sections of the island.

Hutchinson Island has approximately one mile of public beach (4,150 feet or about 12 percent of the island's total beach area). There are only small areas on Jupiter Island for public use of the beaches. However, this situation should soon be remedied, since the state has purchased the northern 2.7 miles of the island for a state park and public beach. At present, public access to this area is difficult; therefore, it is used very little. A causeway from the mainland to the beach areas has been proposed which would greatly expand access to the area. The combined public beach on both Jupiter and Hutchinson Island provide some 480 linear feet of beach for every 1,000 residents of the county. Not included in this figure, however, is the beach front seaward of private property which is bound by the mean high water mark. Due to the difficulty in reaching the beach, this beach-front is excluded even though it is public property.

Erosion History

There are two primary sources of erosion of the beaches and coastline, 1) storm damage and 2) wave action and littoral transport.[1] Storm erosion, however, is generally of greater significance and is caused by two types of storms. These two types of storms are the tropical storms, generally referred to as hurricanes and tropical depressions, and the extra-tropical storms, known as northeastern coastal storms. The northeastern storms occur almost annually and for the most part cause the most severe and lasting erosion of the shoreline.

Between 1830 and 1979, sixteen hurricanes passed within a 50 mile radius of the county, averaging one every nine years. One reason for the limited severity of the hurricanes' erosion damage is the short duration of hurricane force winds and waves in the area. However, the large intense Atlantic storms, generally caused by a stationary high pressure area north of a low pressure area, cause great damage to the beaches and ocean-front property, not only in Martin County but also along most of the east coast of Florida.

The northeastern coastal storms attack the ocean-front during the fall and winter months. They reportedly cause more severe erosion to the beaches in two or three months than by winds and swells from other storm forces during the remainder of the year. Should a northeastern storm occur when the moon is in perigee, it is accompanied by

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1. Littoral transport is a lateral continuous process of withdrawal and redepositing of beach material by tidal forces. Erosion occurs when withdrawals are greater than redeposits of sand and beach material.

abnormally high tides. When this combination of large waves from the northeast and high tides lasts for several days, it usually causes more sand movement than the average hurricane.

The second source of erosion is littoral forces. The barrier islands of Martin County are situated so that the beach areas are normally subject to low steepness waves (long periodic swells), which over time tend to transport back to the beach material which was eroded from the beach and carried off by previous high steepness waves (storm type waves). Although this process is noticeable on both islands, it is particularly evident on the southern portions of Jupiter Island.

The original inlet or channel between Hutchinson and Jupiter Islands, known as "Gilbert's Bar," was a very shallow, narrow pass. This pass was subject to constant change, as sand from littoral drift altered the depth, width, and general character of the pass. Then, in 1849, Gilbert's Bar was closed by sand accumulated from littoral drift. The original cut of St. Lucie inlet was made in 1892 by local residents. It was dug by hand with picks and shovels and was approximately 30 feet wide and some five feet deep. By 1898 strong currents through the cut widened the inlet to nearly 1,700 feet and scoured it to an average depth of seven feet. This natural widening continued until 1922, when the inlet was reported to be some 2,600 feet wide. This was the widest the inlet ever reached, as the width has since decreased to approximately 1,800 feet by soil accumulation from local dredging operations.

Between 1926 and 1929, the St. Lucie District and Port Authority constructed a stone jetty along the southern end of Hutchinson Island at Sailfish Point which measured 3,325 feet long. A popular theory with the residents of Jupiter Island is that much of the erosion along the northern portion of the island has been caused by the construction of the jetty. Prior to the construction of the jetty, the inlet acted as a barrier, trapping the drift material in a middle ground shoal and in a bar across the mouth of the inlet. As a result of this trapping action, both the shores north and south of the inlet became unstable.

However, after construction, the jetty stabilized the north shore and caused accretion to begin. Subsequently, the effectiveness of the inlet as a littoral basin became enhanced, causing the shore to the south (northern Jupiter Island) to continue to recede. Consequently, the jetty aggravates the erosion to Jupiter Island, although it is not the cause of the erosion. This aggravation is the result of the jetty's trapping the particles moving south along the beach, thus starving the shoreline immediately south of the jetty. Since the dominant littoral drift in the area is from north to south, there is a tendency for build-up north of the jetty and starvation south of the jetty.

Although the threat of erosion exists throughout the county, the shoreline of Hutchinson Island is relatively stable, with accretion occurring primarily in the southern portions of the island just north of St. Lucie Inlet and the jetty (Sailfish Point). Northern Jupiter Island, however, has a long history of erosion problems. The relatively continuous erosion of the island is greatly magnified

during periods of tropical hurricanes and extratropical storms. During such storms, damage to the beach is accelerated and is often accompanied by damage to seawalls and ocean-front property. After several northeast storms, the beach level is lowered, structures are damaged or destroyed, and valuable ocean front property is eroded or lost. The natural buildup from littoral drift which occurs during the summer months usually reduces the erosion of the previous fall and winter, but the buildup is usually not great enough to offset the storm generated erosion.

Between 1882 and 1964, the 16 miles of shoreline south of St. Lucie inlet annually receded an average of six feet. During the same period, the two miles north of the inlet annually accreted at an average of 2.6 feet. However, the northern portion of Jupiter Island, in particular the subdivision Bon Air Beach and the area northward, eroded at a rate as great as ten feet per year since the late 1920's.

Corrective Action

The residents of the Town of Jupiter Island attempted to prevent erosion damage by building revetments and groins, and by artifically renourishing the beaches. The residents had vertical seawalls built along most of the established bulkhead line on Jupiter Island, as recommended by the 1947 Beach Erosion Control Board Report. Construction, completed in stages, has been accomplished along most of the developed portions of Jupiter Island. The artificial renourishment of the beaches began in 1956 by the Town of Jupiter Island, and in 1963, a private engineering firm developed the following four-phase erosion prevention plan for Jupiter Island:

Phase I - Artificial nourishment in the amount of 500,000 cubic yards over a three year period.

Phase II - Protection and strengthening of existing seawalls where needed.

Phase III - Annual period nourishment as needed after completion of Phase I.

Phase IV - Construction of groins about 100 feet long at 200 foot intervals after beach nourishment.

This plan has been partly adopted by the Town of Jupiter Island, with Phases I and II essentially accomplished.

As requested by local officials and residents of Martin County, a study prepared by the United States Army Corps of Engineers[2] and completed in March 1974, examined the impact of widening the St. Lucie Inlet. The Inlet Stabilization Plan initiated the stabilization of the shoreline and channel conditions in the St. Lucie Inlet. In the Final Environmental Statement on Navigation and Beach Erosion Control, the United States Army Corps of Engineers made the following recommendations:

1. extension of the north jetty by some 500 feet
2. sand excavation
3. construction of a south jetty
4. widening of the cut of the St. Lucie Inlet
5. beach renourishment south of the inlet with the sand excavated

As development pressures increased in the 1970's from dwindling developable coastal areas and a rapidly increasing state population, the Martin County Commissioners authorized Peat, Marwick, Mitchell

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2. Final Environmental Statement, St. Lucie Inlet, Florida, Navigation and Beach Erosion Control, Office of Chief of Engineers, Department of the Army, Washington, D.C., 1974.

and Company, to prepare a comprehensive development plan for Hutchinson Island. The Hutchinson Island Plan was prepared to determine how best to plan for and manage future growth on Hutchinson Island. The plan as presented included the following recommendations:

1. A new four-lane bridge should be constructed from the mainland to Hutchinson Island.
2. An additional 1,824 dwelling units should be permitted on the Martin County portion of the island prior to construction of the new bridge.
3. At full development, a maximum of 4,475 residential units should be permitted on the Martin County portion of the island.
4. Public services should be designed to provide for approximately 10,000 residents.
5. Development south of the beach access strip and north of the House of Refuge should be limited to an overall density of 1.5 dwelling units per acre.
6. Remainder of the island (the Martin County portion) should be limited to an overall density of six dwelling units per acre.
7. Martin County should institute PUD zoning procedures.
8. A single special tax district should be established for Hutchinson Island.

These recommendations were later revised to allow 2,394 additional units prior to bridge construction (increased from 1,824) and total development of 5,236 units (increased from 4,475). Portions of the initial plan were adopted by the Martin County Commission on August 14, 1973, in resolution # 73-8.2. The revisions were adopted under resolution # 73-12.6.

Additionally, Hutchinson Island has been evaluated by the Division of State Planning, Bureau of Land Planning, as an Area of Critical State

Concern. A report on that evaluation, issued in 1974 under the provisions of Chapter 380 of the State of Florida Statutes (Florida Environmental Land and Water Management Act), indicates that the study was done at the request of local public officials and concerned local citizens. The study identified and analyzed the natural and environmental forces of the island, public investments on the island, existing land uses, and development pressures. The public concerns expressed and evaluated included:

1. need to protect the natural and environmental resources and functions of the area from adverse impacts of development
2. need to allow reasonable development and residential density on Hutchinson Island in order to deal realistically with population pressures on market values
3. need to protect existing and required future public investments in facilities and services, especially in transportation, water and sewer systems, and public safety from the effects of rapid or uncoordinated development of excessively intensive land use
4. need to protect the island's residents and resources from the threat of hurricane flooding, since nearly all the developable land on Hutchinson Island is in a hurricane flood zone
5. need to coordinate existing local efforts to meet the foregoing problems in a manner which reflects the island's physical structure and needs, as well as its political boundaries.

The Bureau of State Planning, in its evaluation of Hutchinson Island, noted that both St. Lucie and Martin Counties developed comprehensive development plans for Hutchinson Island. The only concern expressed by the State was that these two governing bodies (Martin County and St. Lucie County) had each developed their respective plans independently and were implementing them independently. The State recommended that a council of governments be established,

as currently proposed by the two counties, to facilitate coordination between plans and governments. The State further recommended that Hutchinson Island not be named an area of critical state concern, citing the strength of local controls and planning as a major reason.

CHAPTER IV

THE IMPACT OF THE NATIONAL FLOOD INSURANCE PROGRAM

The assessment of the impact of the National Flood Insurance Program is presented in three sections within this chapter. Each section examines the impact of the program with respect to a specific program objective. Each section contains separate experimental hypotheses and designs.

State and Local Regulation Impact

The methodology in this section was designed to determine whether any land use regulations implemented after 1968 were inspired by the National Flood Insurance Program. The experimental hypothesis tested in this section is:

> The National Flood Insurance Program has not increased state and local land use regulation which discourages the development of the flood prone coastal areas of Martin County.

The methodology used to test this hypothesis is very simple. All state and local land use regulations implemented after 1968 were examined for their potential to restrict or modify development in flood plain areas. If the regulations could restrict or modify development on the flood plain, it was also assumed to discourage flood plain development by making development more difficult. Next, the legislative history of the regulation was examined. If legislative precedent for the regulation was established after 1968, the regulation was assumed to be potentially precipitated by the

National Flood Insurance Program. Finally the regulation was examined for specific provisions for flood plain areas. If the regulation was found to contain no specific provisions for flood plain areas, the regulation was assumed to be too universal to have been precipitated by the National Flood Insurance Program.

Using the above impact criteria, each regulation established after 1968 was scored as "1" under the Development Restriction category, if the regulation could restrict or modify flood plain development and a "0" if it could not. The regulation was scored a "1" under the Legislative Precedent category if the legislative initiative for the regulation occurred after 1968 was found and "0" if the initiative was prior to 1968. Last, the regulation was scored a "1" under the Restrictive Application category if the regulation had provisions which applied specifically to flood plain areas and a "0" if the regulation was more universally applicable. The scores for each category were summed. The regulation was assumed to be precipitated by the National Flood Insurance Program if the sum of the category scores was three. Table 4.1 contains the scores of the regulations examined. Since the sum of the scores for any regulation was less than three, the National Flood Insurance Program was found to have not precipitated any state or local land use regulations.

Mortgage Market Impact

The methodology in this section was designed to determine whether the National Flood Insurance Program has influenced the lending policies

TABLE 4.1

STATE AND LOCAL REGULATORY INITIATIVE

Regulation	Level	Development Restricting	Legislative Precedent	Restrictive Application	Sum
Chapter 20	State	0	0	0	0
Chapter 23	State	0	0	0	0
Chapter 160	State	0	0	0	0
Chapter 161	State	1	0	1	2
Chapter 163	State	0	1	0	1
Chapter 253	State	1	0	0	1
Chapter 258	State	1	0	0	1
Chapter 259	State	1	1	0	2
Chapter 370	State	1	0	1	2
Chapter 372	State	0	0	0	0
Chapter 373	State	1	0	1	2
Chapter 375	State	1	0	1	2
Chapter 376	State	0	1	0	1
Chapter 380	State	1	1	0	2
Chapter 403	State	0	1	1	2
Zoning Regulations[1]	Local	1	0	1	2
Subdivision Regulations[2]	Local	1	0	1	2
Landscape Regulations[3]	Local	1	1	0	2
Beach Preservation Control[4]	Local	1	0	1	2

1. Zoning regulations, 1975 Martin County Code, Sections 23-15, 3 Art 26 A.

2. Subdivision Controls, 1975 Martin County Code, Sections 30-½-8, 9, 22, 23. Town of Jupiter Island, 1975 ordinances, #19, 65.

3. Landscaping ordinances, Martin County Code 1975, Section 23-49.

4. Tree and wildlife protection ordinances, 1964 Jupiter Island ordinances, #75, 117, 118.

by savings and loan associations. The specific hypothesis tested in this section is:

> The National Flood Insurance Program has changed the lending policies of the savings and loan associations which serve the Martin County beach-front resulting in increased financing opportunities for beach-front developers.

The general population considered by this section consists of the main offices of all savings and loan associations in Martin, Palm Beach, and St. Lucie counties. Only savings and loan associations were surveyed since they are the traditional source of funds for permanent loans on single-family homes.

All seventeen of the savings and loan associations comprising the population were surveyed by mail. Because of the desire for anonymity and because of a high response rate expected, follow up surveys were not included in the methodology design. Consequently, the results of the survey were constrained by an 83 percent response rate. This response rate was deemed acceptable,since the nature of the information desired consisted of any change in the lending policies of the associations, rather than the determination of the magnitude of the change.

Since there has been limited research on institutional lending policy on beach-front property, no standard or representative instruments were available; therefore, a survey instrument was developed. (Appendix A contains a copy of the instrument and the cover letter that was attached). The instrument consisted of three open-end questions about outstanding loans on the Martin County Atlantic Oceanfront.

All the institutions responding to the survey now require flood insurance to lend on ocean-front property. (This result is simply consistent with the law, since the institutions may not now make loans in flood plains without the mortgagor's obtaining flood insurance). Since the availability of flood insurance, 20 percent of the respondents indicated a new willingness to lend on ocean-front property. Only one respondent (7 percent) stated that the institution will not currently lend on ocean-front property. Finally, about 40 percent of the respondents indicated that they have outstanding loans on Martin County Ocean-front property. Based on the above results, the National Flood Insurance Program was found to have increased lending volume on Martin County Beach-front properties.

Property Development Impact

This section describes the methodology which was designed to determine the impact of the National Flood Insurance Program on coastal development. The hypothesis in this section is:

> The National Flood Insurance Program has not been successful in discouraging development on the Martin County Beach-front.

The general population considered within this section consists of all properties which touch the Martin County ocean-front. Every privately owned property within the population was selected to comprise the sample. Publically-owned properties were excluded for three reasons. First, there were so few improvements on publically owned properties, no reliable development patterns could be deduced. Second, the National Flood Insurance Program was not designed to influence public sector development. Finally, the government should theoretically always build

at society's optimal building distance from the ocean because governments holding period, capital costs, and benefits should be equivalent to society's.

Data for this portion of the study were collected on 138 parcels on Hutchinson Island and 215 parcels on Jupiter Island. Connecting properties under the same ownership were combined into single parcels. For each parcel, the following data were gathered:

1. Square footage of property
2. Linear footage of beach-front
3. Linear footage of highway
4. Zoning classification
5. Current land use
6. Square footage of improvements
7. Linear feet from improvements to mean high water mark
8. Highest ground elevation between structure and ocean
9. Age of improvements

The data sources used to gather the information on each parcel were the Martin County public records and aerial photographs of the beach-front.

Using the data collected and census data from 1930-1970, a systems model of development patterns was designed to project forward the historic development patterns before the implementation of the Flood Insurance program. The projection of the historic patterns could then be compared with the patterns that have actually occurred since implementation of the program.

The model was programmed using a systems modeling program from Massachusetts Institute of Technology, named DYNAMO. The calculation of the appropriate model coefficents used data on development prior to implementation of the National Flood Insurance Program. Projecting the model from 1930-1970, the model was found to have an r^2 of .833, when actual development was compared with the development predicted. The model was then projected through 1976. The development projected was then compared with the development which had occurred to determine whether development had been discouraged since the implementation of the National Flood Insurance Program. Appendix B contains a copy of the modeling program used.

The development rate since the implementation of the National Flood Insurance Program was found not to have fallen ($p. < .05$). Therefore, the National Flood Insurance Program is assumed not to have discouraged development on Martin County beachfront.

CHAPTER V

THE IMPACT OF THE COASTAL CONSTRUCTION CONTROL LINE

The assessment of the impact of the Coastal Construction Control Line (CCCL) is presented in seven sections. The first six sections examine the specific methodologies used to examine the costs and benefits of the implementation of this legislation to the public and/or private sectors. The final section of this chapter examines the net cost-benefit of the legislation.

Experimental error throughout each methodology was controlled in favor of overestimating the benefits and underestimating the costs of implementation of the CCCL. For example, storm protection benefits were estimated by using a storm projection method that assumed future storms could have wave surges about one foot higher than any previously experienced storm in the area. Governments were assumed to have provided maximum financial aid in the event of a disaster. The methodology therefore assumes that all property owners will carry federal flood insurance so that the bulk of the losses will be borne by the public. Without such government assistance, property owners would have to bear more of the losses.

Each methodology provided an estimate for a specific cost or benefit of implementation of the CCCL. Together, these estimates provided the basis for determining the cost-benefit relationship of the legislation. This relationship is used to test the following specific hypothesis:

The implementation of the Coastal Construction Control Line has resulted in current and near future net costs to both the public and private land owners of beachfront properties.

The general population considered within this chapter consists of all properties which touch the Martin County Atlantic Ocean. All privately-owned property within the population was selected to be the experimental sample. Publically-owned properties were excluded for the same reasons mentioned in Chapter IV.

The following information was gathered for each parcel in addition to the information collected for the sample mentioned in Chapter IV.

1. Legal description
2. Current owner
3. Sales history since 1966
4. Assessed valuation
5. Linear feet between improvement and Coastal Construction Control Line

Storm Damage Reduction Benefits

The expected annual storm damage from tidal floods was calculated for those structures seaward of the CCCL. Estimation of storm damage for those structures landward of the CCCL was unnecessary, since they are not regulated by the building line. It should be noted that while storm wave surge is the greatest cause of storm damage along the coast, wind damage also occurs. Construction behind the CCCL would provide some wind protection benefits, as the CCCL is usually behind the dune system. Wind damage, however, is relatively minor, and estimation of wind protection benefits would be extremely

tenuous. Therefore, they were omitted from the study, but are believed to be more than accounted for by liberal estimation of other benefits.

Expected storm damage was estimated using the actuarial rates published in the Flood Insurance Manual of the National Flood Insurance Program. These actuarial rates were incorporated into formula which calculated the expected storm loss for any given year. There has been some criticism that the published rates are seriously underestimated in coastal areas. This criticism is based upon the belief that the actuarial rates do not include wave surge resulting from ocean flooding. (There is some merit to this belief. Actuarial rates are based primarily, but not exclusively, upon riverine flooding). The following formula adjusts for this problem by adding wave surge to the expected flood elevation. This adjustment is termed Standard Project Tidal Flood and is accounted for in the "h" term of the equation for expected loss E(L). The "h" term also incorporates an additional adjustment which relates the slope of the beach seaward of the structure to the height of the wave runup.

$$E(L) = 1.5\ (FFIP_{hsi} + .5\ FFIP_{hci})\ (V_{si})$$

Where:

1. $E(L)$ = Expected storm damage loss for structure s for individual i.
2. $FFIP_{hsi}$ = Actuarial premium for structure s for individual i based upon relative flood elevation h.
3. $FFIP_{hci}$ = Actuarial premium for contents c for individual i based upon relative flood elevation h.
4. V_{si} = Value of structure s for individual i.

5. h = Highest elevation seaward of structure (Standard Project Tidal Flood + (60 · highest elevation seaward of structure/distance from highest elevation to mean high water mark))

6. 1.5 = An adjustment for a high hazard area as specified by the flood insurance manual.

7. .5 = An adjustment commonly used in the insurance industry to estimate the value of the contents. For example, contents are normally estimated at one-half of the value of the structure.

Applying the preceeding formulae, to those structures seaward of the CCCL, the expected storm damage estimates for all properties total $23,379 per year. Property owners are assumed to carry federal flood insurance for which they would pay a total of $4,166 per year. If development patterns of the past were to continue, the payments could be expected to grow $241.99 per year. Thus, the expected losses to the property owners seaward of the CCCL are assumed to be $4,166 per year. The expected benefit to the property owners from construction landward of the CCCL is assumed to be the same $4,166. (This expected benefit to the property owners is deliberately overstated. Flood insurance premiums for properties behind the coastal construction control line are not zero).

Analysis of the storm damage reduction benefits would not be complete without analysis of the federal costs of disaster assistance. Federal disaster assistance costs that can be reduced by forcing development landward of the CCCL, are of three type

1. Federal Disaster Assistance Administration grants for debris removal, demolition, and emergency beach protection.

2. Small Business Administration subsidized loans for reconstruction.

3. Federal Flood Insurance benefits.[1]

These expected benefits were estimated using data from the subsidies received during Hurricane Eloise. (The subsidy per structure in Bay County seaward of the CCCL at the time of Eloise was calculated). To reflect inflation since that time, this subsidy was then adjusted upward. These subsidies should be viewed as maximum possible subsidies, as the development pattern in Bay County is very different from Martin County. Bay County had 44.44 percent of the development on the beaches seaward of the CCCL, as compared to only 9.92 percent in Martin County.

Using the procedure described above, the expected annual federal susdidies for those properties seaward of the CCCL were calculated as follows:

1.	Federal Disaster Assistance Administration	$ 360.50
2.	Small Business Administration	$ 889.64
3.	Federal Flood Insurance Benefits	$ 19,213.26

If the development patterns of the past were to continue, these subsidies could be expected to grow at $957.75 per year.

Recreational Benefits

In a previous study of Bay County (Shows, 1976), a high recreational value was attributed to the increase in available

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1. There is also a federal income tax subsidy which is being ignored. The income tax subsidy could be used if the flood insurance benefits were not paid. Since the flood insurance subsidy under the emergency program is about 82 percent of the expected loss, and the income tax subsidy could at most be 70 percent (and most likely only around 30 percent) of the expected loss, the flood insurance subsidy would be preferable in most cases. Furthermore, it would more than cover any income tax subsidy costs that are omitted.

beach when development was forced further landward. In this study, however, recreational benefits from potential increases in beachfront are estimated to be insignificant. This conclusion is considered appropriate for three reasons.

First, existing and current development patterns use very little of the land seaward of the CCCL. Most of the small amount of the seaward development is still behind the dunes and usually no more visible than that of structures immediately landward of the CCCL.

Second, there is currently sufficient public beach and vast amounts of private undeveloped beachfront. Due to the slow rate of development along the beach, these vast undeveloped areas are unlikely to disappear soon.

Third, the additional beach exposed by forcing some development landward would still be the property of the riparian owner. The only possible recreational value this land could have would be attributable to a minor increase in visual open space. The public would be trespassing if they actually used the beach above the mean high water line. Therefore, there could be little value attributed for public use of the property.

Administrative Costs

In calculating the administrative costs for the CCCL, only those costs directly attributable to the Bureau of Beaches and Shores were considered. Excluded are those state costs for overhead and administration incurred outside the agency. Also excluded are costs incurred by local governments when a state permit is required. Therefore, the administrative costs must be considered as conservative.

In calculating the costs for establishing and updating the CCCL, the following reasonable amortization period and capital cost were selected. (1) The initial establishment of the CCCL was amortized over 40 years to reflect the approximate economic life of the structures which the line is designed to protect. (2) An interest rate of 5½ percent was used to reflect the cost of money for the general public, as measured by interest paid upon public savings. In the previous Bay County study (Shows, 1976), the cost of establishing the CCCL was estimated at $2,500 per mile. The cost of each five year review was estimated at $5,000 per mile. Using these figures, the annual costs for Martin County's 22 miles of beachfront are estimated at $3,427.60 for establishment of the line and $25,759.41 for periodic reviews.

Variance Costs to the Riparian Owners

The variance costs to the riparian owner accrue from two major sources — variance preparation costs and holding costs. (Appendix C contains a checklist used by the Department for processing variances and contains the rules and procedures for obtaining a variance.) Variance preparation costs are estimated to average $1,330. These costs include $60 (six hours at $10 per hour) for correspondence and $20 (two hours at $10 per hour) for conferences with agency personnel.[2]

The primary cost component of variance preparation is for topographic surveys. Three types of topographic surveys are required. First, the mean high water line must be established. Second, the CCCL

2. The number of hours required for consultations with agency personnel was estimated by the Bureau of Beaches and Shores.

must be surveyed. Finally, a one-foot contour topographic survey is conducted for the parcel, identifying location of proposed construction. Based on the average size of developed lot of 158 feet x 300 feet, this cost is estimated to be $1,250.[3]

Holding costs occur from two sources. First, there is a cost of having underdeveloped land tied up in an unproductive use during the variance proceedings. This cost is estimated at $1,806[4] for vacant land and $0 for land already in productive use. Since 48 percent of the variance applications have been for vacant land, the average cost per variance is $867. The more significant holding cost is the inflation of the price of building materials, currently averaging over 12 percent per year. Every day saved becomes a significant cost savings. This cost is estimated at $3,180 per variance for single-family dwellings (193/365[5] days x $66,818[6] x .09).

Holding costs for boulder revetments and beach sand are estimated at $188. This cost is computed as the mean variance processing time for this type of variance * average daily price increase of the

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3. This figure was determined through interviews with local land surveyors and engineers.

4. This figure represents the mean land value ($37,950) x $\left(\frac{\text{mean processing time of 193 days}}{365}\right)$ x (prime rate of .09).

5. Mean variance processing time for single-family dwellings in Martin County, 1972-1977.

6. Mean estimated construction cost from building permits along beach in Martin County, 1969-1977, with no adjustment for inflation.

materials * mean value of the improvements. Using this same procedure, the holding cost for a variance requesting a pedestrian access across the dune is estimated at $21. Weighting each type of variance holding cost according to the frequency of occurrence in Martin County, the mean holding cost per variance is $2,659.

Combining all variance costs, the mean cost per variance is $3,989. Based on projections of past variance requests per year, the expected annual cost to the riparian owners is $27,923.[7]

Property Value Impacts

The most direct approach to estimate the impact of the CCCL on property values would be to examine comparable sales before and after the implementation of the law. There were two conditions that precluded the use of that approach: (1) There were insufficent numbers of comparable sales before and after implementation, and (2) simultaneous to implementation of the CCCL, other impacts were felt, such as the availability of federal flood insurance and a recession in the general economy. Thus, the impact of the CCCL would be impossible to separate from other influences upon property prices.

A different approach to the estimate impact of the CCCL on property values was developed. Any change in property values due to implementation of the line must be caused by market perceptions of an impact upon the expected utility of that property. To determine whether there was a market perception of a change in net utility of

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7. It should be noted that of the 12 variances granted for single-family homes between 1972 and 1977, only two have been built.

the properties, variances among the sale prices of residential properties in the following four groups were calculated and statistically compared.

1. Developments built prior to implementation of the CCCL and seaward of the line.
2. Developments built prior to the implementation of the CCCL and landward of the line.
3. Developments built after the CCCL implementation and needing a variance.
4. Developments built after the CCCL implementation in compliance with the line.

These groups were chosen to detect any property value difference due to the nearness of the structures to the sea, or any cost inequity imposed on new construction seaward of the CCCL by the variance procedure of the CCCL law. Properties having structures nearer the ocean could be expected to be valued higher than those further from the ocean due to a superior view and reduced transport cost to the beach. These benefits may be offset, however, by higher expected storm damage costs and possible nuisance costs imposed by the general public's sharing of the beach seaward of the mean high water mark. Property with structures which required variances to be built could be expected to be valued less than properties in compliance. The need for state permits for any structural alterations would increase the cost of any such modifications. At the same time, properties with structures requiring variances may enjoy the competitive advantage of a superior view, so that the net effect is intuitively unclear.

As might be expected from the wide fluctuations in lot and improvement sizes, the variances of sale prices within and between

groups were very large. In order to compensate for these variances, an adjusted price per square foot of land was computed by subtracting standardized values for improvements. The general regression equation used for standardization was as follows:

$$\text{Sale price} = B_0 + B_1 (\text{sq. ft. of property}) + B_2 (\text{No. of beachfront ft.}) + B_3 (\text{No. of highway front ft.}) + B_4 (\text{sq. ft. of improvements}) + B_5 (\text{age of improvements}) + B_6 (\text{sale date})$$

Using this general model as a theoretical starting point, alternative models were developed by using transformations of significant variables and deleting nonsignificant ones. The resulting equation used for standardization, including the significant regression coefficients, was:

$$\begin{aligned}\text{Sale price} = {} & 415.00 + .89 (\text{square feet of property}) \\ & + 111.50 (\text{beachfront feet}) \\ & + 32.89 (\text{square feet of improvements}) \\ & - .40 (\text{age of structure in 1977})(\text{square feet of improvements}) \\ & + .0451 (\text{sale price})(1977 - \text{year sold})\end{aligned}$$

Where:

415.00 = intercept term
.89 = marginal contribution of the lot size to expected value
111.50 = marginal contribution of the front footage on the beach to expected value
32.89 = cost per square foot of undepreciated structures
.40(age) = marginal cost of depreciation
.0451 = marginal contribution of market inflation to expected value

The mean adjusted price per square foot of property was then computed for each of the four groups. These means were then tested for

significant differences. No significant differences among the means were found at alpha = .05. The property value impacts were thus concluded to be zero.

Tax Base Impact

Two factors comprise any potential impact on the tax base of Martin County. First, any net impact on beachfront property values would directly impact the tax base. Second, any change in the development patterns of beachfront properties would correspondingly impact the growth pattern of the tax base. Since no impact on property values was found, there is assumed to be no impact on the tax base resulting from a change in property values.

An examination of the overall development patterns between 1900 and 1977 indicates a distinct curtailment of development since the early 1960s. Also, an analysis of the variance request history and building permit activity shows that only 16.6 percent of the requests for single-family home variances have ended in the construction of the buildings, while over 50 percent of the building permits granted on the continental side of the barrier islands have been built. This comparison suggests that development activity may have been slowed by imposition of the CCCL but many other factors may also have influenced development patterns. Thus, no cost was assigned for a slowing in the growth rate of the tax base resulting from the CCCL.[8]

---

8. The Martin County Property Appraiser makes no adjustment, positive or negative, for properties located seaward of the CCCL, further substantiating the empiric evidence that values of such properties are neither penalized nor enhanced.

Net Cost-Benefit

Table 5.1 is a summation of the costs and benefits of the CCCL estimated as if the CCCL could have been implemented prior to any development. This table gives an indication of the maximum theoretical value of the CCCL. Costs are listed in negative numbers. This table indicates a lack of economic justification for implementing the CCCL because neither the public nor private landowners receive any net benefit.

TABLE 5.1
COST-BENEFIT SUMMARY OF THE CCCL AS IF ALWAYS IMPLEMENTED

Cost/Benefit	Annualized Amounts	
	Public	Private
Storm Damage Benefits	$ 20,463	$ 4,166
Recreational Benefits	0	0
Property Value Impact	0	0
Administrative Costs	- $ 56,380	NA
Variance Costs	--	- $ 27,923
Net Cost-Benefit	- $ 35,917	- $ 23,757

Table 5.2 contains the estimated costs and benefits of the CCCL since its implementation in 1977, 1987, 1997, 2027. This table shows the current and projected future cost-benefit relationships for the CCCL. The future relationships (for the years 1987, 1997, and 2027) are projected from historic and current experience with the CCCL. Examination of Table 5.2 reveals that even through the year 2027 there will be a net total cost of the CCCL. Subtracting variance procedure costs as costs borne by the private sector, only in the projection for the year 2027 will expected annual benefits exceed the expected

annual costs for the public sector. It should be noted, however, that if cumulative costs were examined, the public never receives an expected net benefit. The implementation of the Coastal Construction Control Line was therefore found to have resulted in current and net costs to both the public and beachfront owners.

TABLE 5.2
COST-BENEFIT PROJECTIONS

Cost/Benefit	Annualized Amounts in Constant Dollars			
	1977	1987	1997	2027
Public				
Storm Damage Benefits	6,790	20,370	33,950	74,690
Recreational Benefits[1]	0	0	0	0
Property Value Impacts	0	0	0	0
Administrative Costs	-56,380[2]	-56,380	-56,380	-56,380
Subtotal	-49,590	-36,010	-22,430	+18,310
Private				
Variance Procedure Costs	-27,923	-27,923	-27,923	-27,923
Net Cost-Benefit	-77,513	-63,933	-50,353	-9,613

1. Recreational Benefits remain unchanged, since even after 50 years there would be only 28 structures seaward of the CCCL.

2. Includes expected costs of the completion of the five-year reassessment of the CCCL.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Over the last two decades, the state and federal governments have become increasingly involved with land use regulations. This regulation may be classified in two categories. The first category is that of indirect regulation which may be called "carrot and stick" regulation. This regulation provides an incentive (the "carrot") to encourage cooperation with the regulation and special santions (the "stick") if cooperation is not achieved. The second category is that of direct regulation. This type of regulation exerts direct control over land use through the exercise of the police power.

State and federal land use regulations have frequently been precipitated by the failure of some local governments adequately to regulate development within their communities. This failure may have been caused by a lack of sufficient local information on the consequences of the development patterns or by the undue local influence of special interest minorities. Unfortunately, when the state and federal governments must make land use regulations, the resulting regulations must have sufficiently broad application to influence development in many different geographic areas. Local conditions may vary widely from one regulated area to another; consequently, the impact of the legislation will also vary.

The rational for coastal zone regulation must be understood from its historic, economic, and legal perspectives. Much of the development along the coastal areas prior to the late 1960's, removed all or part of the sand dune systems which protected and replenished the beaches. At that time, few people realized the role of the dune system in storm protection or beach nourishment.

The economic justification for public regulation of beachfront development is based upon the theory of the existence of an optimal building line along the coast for society. Because of the relatively short holding period for the developer and his relatively high cost of capital, the developer will have economic incentives to build seaward of society's optimal building line.

Coastal zone land use regulation is constrained by the United States Constitution which places certain restrictions upon the legislation. These restrictions include limitations on the taking of private lands by the government and limitations on infringement of the rights of citizens to the due process of the law, to be treated equally under the law, and to travel freely and live in any public community within the United States of America.

In an effort to curb exponentially growing public expenditures for disaster relief, the federal government created the National Flood Insurance Program. This program expected to curb disaster expenditures in two ways. First, some of the disaster expenditures would be transferred back to the people choosing to develop flood areas. This was accomplished by encouraging the people to accept a certain loss annually in the form of flood insurance premiums in

order to protect themselves against a much larger uncertain loss from a flood disaster. Second, the program intended to discourage flood plain development in the future, thereby reducing the growth of disaster payments.

Faced with increasing destruction of its beachfront natural resources, the State of Florida enacted the Beach and Shore Preservation Act. One provision of the act provided the mechanism for the establishment of the Coastal Construction Control Line along the beaches of Florida. The legislation provided for strict state control of construction seaward of that line. The state could then be assured of some control over the destruction of the beach sand dune system.

Martin County has 22 miles of ocean shoreline which, like much of Florida's Atlantic Coast, consists of barrier islands. On the northern island, Hutchinson Island, development has been relatively sparce (except for a boom of multi-family developments) since 1968. On the southern island of Jupiter, primarily single-family development has occurred. The homes on Jupiter Island are luxurious, averaging over 4,000 square feet, with beachfront lots of over one acre. Perhaps due to the wealth of the residents, local involvement in land use regulation extends back as early as 1947. Since then, the community has taken an active role in the control of undesirable development and beach erosion curtailment.

The National Flood Insurance Program was found not to have encouraged new state and local flood plain regulations applicable in Martin County. The Program was also found to have increased the

financial opportunities for beachfront construction. Finally, the Program was found not to have discouraged development in the coastal flood plain. All of these findings directly contradict stated legislative objectives.

The implementation of the Coastal Construction Control Line was found to impose a net cost on the public. That is, the benefits resulting from the program do not offset the costs incurred through implementation and administration of the program. There was no measureable impact on single-family residential property values resulting from implementation of the program. The land utilization pattern on Jupiter Island has been essentially unchanged, while the only change in land utilization on Hutchinson Island has been increased multi-family residential development, for which there is no identifiable link to the CCCL program. With respect to multi-family development, there has been general compliance with the letter of the law, but unwillingness to comply with the intent of the law. That is, multi-family developments have been constructed as close to the CCCL as possible.

This study suggests that the law is cost unfeasible primarily because historic development patterns have been prudent and reasonable. Thus, there is little reduction in the expected storm damage after implementation of the CCCL. Since the development of multi-family projects occurred primarily after implementation of the CCCL, there is no apparent evidence of any positive change in the patterns resulting from implementation of the law. In fact, the heights of the multi-family projects impose a significant loss of visual open

space. Additionally, multi-family developments contribute to the erosion problem, even though they may be in compliance with the law by creating expanded traffic on the dunes. Increased traffic reduces vegetation levels and leads to greater erosion. This additional erosion further increases the expected storm damage. Additionally, there is usually a greater purge of vegetation in the construction of multi-family units, since secondary dune lines are usually leveled. Finally, the heights of multi-family units reduce the wind action which would normally help to build up the height of the dunes as a natural form of storm protection.

As indicated previously, the local government bodies in Martin County have generally anticipated beachfront growth problems and have implemented appropriate ordinances to combat those problems. This factor has greatly contributed to orderly growth in the area. However, growth, until the recent past, was limited to single-family residential development, and there are indications that the local ordinances and policies are not as effective in controlling the problems resulting from multi-family development.

Limitations and Recommendations

There are several limitations with respect to this study. Foremost is that any conclusions and recommendations can be applied only to Martin County. This is of particular importance, since the stated regulations were evaluated only with respect to their impact upon Martin County. As such, findings are localized and cannot be applied "carte blanche" to other coastal areas of the state. This localization is crucial, since each area of the state

has its own characteristics, and evaluation of any law must be made with respect to those specifically localized characteristics. Further research in other areas may find many similarities to the results found in Martin County and may therefore suggest changes in state and local land use regulation.

Studies made on the impact of the National Flood Insurance Program and the Coastal Construction Control Line have all been in relatively low population areas. Further studies should be undertaken to determine the impact of selected regulations on a high population area such as Miami Beach. For example, the impact of the historical Flood Insurance Program financing may be be found to be insignificant because existing development pressure on the beaches creates enough incentive to attract non-traditional financing sources.

Another recommendation of this study is that at least in the case of Martin County, the selected regulations should be repealed for single-family development. The National Flood Insurance Program seems only to provide a public subsidy for the single-family residents. The Coastal Construction Control Line seems to be unnecessary in light of the strength of existing local land use controls.

With respect to multi-family development, restrictions should be strengthened to include provisions for additional setback requirements as functions of building height and occupational density. Restrictions on flood insurance for multi-family developments should be increased so that the lender must consider flood damage risk while deciding his lending strategy.

Finally this study suggests that state and federal land use regulations should be reviewed periodically to determine whether the goals and objectives of such legislation are being achieved. Perhaps local governments could also be given the power to periodically review the impact of the state and federal regulations and recommend repealing the regulations in their communities if the regulation is found not to achieve its goals.

APPENDIX A

MORTGAGE LENDER SURVEY AND COVER LETTER

Martin County Coastal Setback Line

Impact Study

Director:
Halbert C. Smith, Jr.

Research Assoc:
Jerry Belloit
D. J. Snapp

June 2, 1978

Attention: Mortgage Lending Officer

Dear Sir:

I am engaged in research of coastal zone land use management policies at the state and federal levels. Of particular interest are the impacts of the Federal Flood Insurance Program and the State of Florida Coastal Construction Setback Line with respect to Martin County, Florida.

It would be greatly appreciated if you could provide us with a general idea, concerning your bank's lending policies with respect to beach-front property, by answering the short questionnaire provided. Enclosed please find an addressed postage paid return envelope for your convenience.

Thank you in advance for your cooperation in this matter.

Sincerely,

Jerry D. Belloit
Research Associate

Enclosures

College of Business Administration
Real Estate Research Center
University of Florida
Gainesville, Florida 32611
904-392-0157

QUESTIONNAIRE

1. Did you make loans on property fronting the Atlantic Ocean prior to the institution of Federal Flood Insurance?

   YES_____ NO_____ If not, what were the reasons for not lending on those properties (i.e., risk, no demand, etc.)

   _____

   _____

   _____

2. Have you made loans on property fronting the Atlantic Ocean since implementation of Federal Flood Insurance?

   YES_____ NO_____ If not, what are the reasons for not lending on these properties?

   _____

   _____

   _____

   IF YOUR ANSWER TO QUESTION #2 WAS "NO" THERE IS NO NEED TO CONTINUE; SIMPLY RETURN THE QUESTIONNAIRE IN THE ENVELOPE PROVIDED.

3. Are there any additional considerations required in the Mortgage Package for property fronting on the Atlantic Ocean above the considerations in a normal mortgage package?

   YES_____ NO_____ If so, what are these additional considerations?

   _____

   _____

   _____

4. Do you have any loans outstanding on the Atlantic Coast of Martin County, Florida?

   YES_____ NO_____

THANK YOU FOR YOUR COOPERATION

APPENDIX B

SYSTEMS PROGRAM FOR PROPERTY DEVELOPMENT

SYSTEMS PROGRAM FOR PROPERTY DEVELOPMENT

```
*  Martin County Beachfront Development Model for
*  Single-Family Development
*  Population Sector (updated from 1970 census)
*
*  Cohort Number 1 (0-15 years old)
*
L  P1.K=P1.J+DT*(BR.JK+NTMG1.JK-DR.JK-MATR1.JK.INFDR.JK)
N  P1=6670
*  (Cohort Population)
A  BR.K=COBR2.K+COBR3.K+COBR4.K
*  (Births = sum of births from mothers in other Cohorts)
R  NTMG1.KL=P1.K*.08138083
*  (Net Immigration into Cohort)
R  DR.KL+P1.K*.0098
*  (Death Rate for Cohort)
R  MATR1.KL+P1.K/15
*  (Matriculation Rate into next Cohort)
R  INFDR.KL+BR.K*.0144
*  (Infant Death Rate)
*
*  Cohort Number 2 (16-25)
*
L  P2.K+P2.J+DT *(MATR1.JK+NTMG2.JK-DR2.JK-MATR2.JK)
N  P2=3625
R  NTMG2.KL=P2.K*.08424092
R  DR2.KL=P2.K*.00130336
R  COBR2.KL=P2.K*.0428546
R  MATR2.KL=P2.K/10
*
*  Cohort Number 3 (26-45)
*
L  P3.K=P3.J+DT*(MATR2.JK+NTMG3.JK-DR3.JK-MATR3.JK)
N  P3=5180
R  NTMG3.KL=P3.K*.07754074
R  DR3.KL=P3.K*.00305707
R  COBR3.KL=P3.K*.02430285
R  MATR3.KL=P3.K/20
*
*  Cohort Number 4 (46-65)
*
L  P4.K=P4.J+DT*(MATR3.JK+NTMG3.JK-DR4.JK-MATR4.JK)
N  P4=6576
R  NTMG4.KL=P4.K*.08236098
R  DR4.KL=P4.K*.00973776
```

```
R  COBR4.KL=P4.K*.00003285
R  MATR4.KL=P4.K/20
*
*  Cohort Number 5 (66 up)
*
L  P5.K=P5.J+DT*(MATR4.JK+NTMG5.JK-DR5.JK)
N  P5=5984
R  NTMG5.KL=P5.K*.13466686
R  DR5.KL=P5.K*.03463511
*
A  TPOP.K=P1.K+P2.K+P3.K+P4.K+P5.K
*
*  DEVELOPMENT SECTOR
*
A  E1.K=LN(ABS(16933-TPOP.K)
A  TDEV.K=3.8+.2695*(LN(TPOP.K)-11)*E1.K*(E1.K-9)
A  DHUT.K=TDEV.K*.1864407
A  DJUP.K=TDEV.K*.8135593
A  DHSL.K=DHUT.K*.25
*  Development Seaward of Setback Line on Hutchinson Island
A  DJSL.K=DJUP.K*09375
*  Development Seaward of Setback Line on Jupiter Island
*
*
*  The function LN is the same as Version III LOGN
*
*  The function ABS is an absolute value function which may
*  need to be achieved through an auxiliary MARCO.
```

APPENDIX C

VARIANCE PROCEDURE SAMPLE CHECKLIST AND REGULATIONS

DEPARTMENT OF NATURAL RESOURCES

Harmon W. Shields
Executive Director

Crown Building/202 Blount Street
Room 420/Tallahassee 32304/904-488-3180

The following information will be necessary before this office can complete its processing of your application for a variance to the established setback line:

_____1. Name, address, and telephone number of the applicant or his duly authorized agent.

_____2. The applicant shall provide the Department with evidence of his ownership and a legal description of the property for which the variance is requested. If the applicant is not the property owner, the applicant shall provide the Department with a duly executed statement from the owner of record, together with proof of ownership, consenting to the work, activity, or construction for which the variance has been requested.

_____3. A statement that the proposed work or activity does not violate any local setback and zoning ordinances.

_____4. Statements describing the proposed work or activity and specific reasons why the applicant feels that the variance should be granted.

_____5. The application shall be accompanied by a recent topographic survey of the property in question, certified by a land surveyor or engineer registered in the State of Florida and showing the following information:

a. The approximate location and the elevation of the mean high water line on the subject property;

b. The location of the setback line for the full width of the subject property;

c. Plot plan of any existing structures and the proposed construction or activity showing the significant distance from the proposed construction or activity to the setback line;

d. If the variance is requested under the provisions of Section 161.052(2)(b), Florida Statutes, or Section 161.053(2)(b), Florida Statutes, the survey shall show the existing structures that are considered to have established the construction line;

e. Variances requested under the provisions of Section 161.053, Florida Statutes, shall specify the distance and direction from the property in question to the nearest setback line permanent referenced monument and the number of that monument.

_____6. Cross section of all sub-grade construction or excavation with elevations references to 1929 sea level datum.

_____7. Elevations of the lowest floor and the first dwelling floor.

_____8. Details of all proposed structures or activities which will be seaward of the setback line.

_____9. Details and justification for any proposed waste water discharge onto, over, under or across the beach and/or dunes, including but not limited to storm water runoff, swimming pool drainage or air conditioner cooling water discharge.

_____10. Additional information:

STATE OF FLORIDA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF MARINE RESOURCES

Secretary of State Codification No. 16B-25

RULES AND PROCEDURES FOR COASTAL CONSTRUCTION AND EXCAVATION

(Variances to Setback Line)

16B-25.01 Scope.

The scope of this rule is to implement Section 161.052 and 161.053, Florida Statutes, in setting forth the requirements and procedures relating to coastal construction and other activities seaward of a setback line, procedures for processing requests for variances and the conditions placed on such variances pursuant to the general authority contained in Section 370.021 (1), Florida Statutes.

16B-25.02 Definitions.

When used in this Rule, the following words shall have the indicated meaning unless the context clearly indicates otherwise:

A. "Department" means the State of Florida Department of Natural Resources.
B. "Person" means any person, firm, corporation, county, municipality, township, special district or any public agency.
C. "Applicant" means any person who has applied or is in the process of applying, for a variance under the provisions of Sections 161.052 and 161.053, Florida Statutes.
D. "Setback Line" (SBL) means the line seaward of which construction or excavation is prohibited under the provisions of either Section 161.052, Florida Statutes, or Section 161.053, Florida Statutes.
E. "Variance" means the authorization by the Department to perform certain specified work or activity in a specified location seaward of the setback line.
F. "Variance condition" means a statement or stipulation issued with a variance with which compliance is necessary for continued validity of the variance.

16B-25.03 General Prohibitions.

A. No person shall make any excavation or place any structure seaward of the setback line except as provided in Section 161.052(2) or 161.053(2), Florida Statutes.

B. In addition to 16B-25.03(A) above, in those counties in which a setback line has been established, under the provisions of Section 161.053, Florida Statutes, no person shall remove any beach material, or otherwise alter existing ground elevations, drive any vehicle on, over, or across any sand dune; or damage or cause to be damaged such sand dune or the vegetation growing thereon except as provided in Section 161.053(2), Florida Statutes.

16B-25.04 Exemptions.

A. The following types of construction work or activity are not deemed to constitute "material alternations", as specified in Section 161.053(5), Florida Statutes, and therefore no permit, waiver, or variance from the Department is required under Section 161.052(2) or 161.053(2), Florida Statutes:

(1) Addition, modification, maintenance or repair to any existing structure within the limits of the existing foundation which does not require, involve or include any addition to, repair, or modification of the existing foundation of that structure. Specifically excluded from this exemption are seawalls and any additions or enclosures added, constructed, or installed below the first dwelling floor or lowest deck of the existing structure.

(2) Minor, temporary, excavation, such as for the installation of utilities, provided that the gound surface is returned to its approximate pre-excavation elevation and that the area of excavation disturbance is revegetated with a suitable type of vegetation. Specifically, excluded from this exemption are excavation for, or installation of, any outfall lines discharging fluids onto, over, under or across the beach and/or dunes.

16B-25.05 Procedure to obtain variance; application.

A. Any person desiring to obtain a variance from the Department shall submit an application to the Bureau of Beaches and Shores, Florida Department of Natural Resources, Tallahassee, Florida, 32304, which shall contain the following information:

(1) Name, address, and telephone number of the applicant or his duly authorized agent.

(2) The applicant shall provide the Department with evidence of his ownership and legal description of the property for which the variance is requested. If the applicant is not the property owner, the applicant shall provide the Department with a duly executed statement from the owner of record consenting to the work, activity, or construction for which the variance has been requested.

(3) A statement that the proposed work or activity does not violate any local ordinances.

(4) Statements describing the proposed work or activity and specific reasons why the applicant feels that the variance should be granted.

(5) The application shall be accompanied by a recent topographic survey of the property in question, certified by a land surveyor or engineer registered in the State of Florida and showing the following information:

(a) The approximate location and the elevation of the mean high water line on the subject property.

(b) The location of the setback line for the full width of the subject property.

(c) Plot plan of existing structures and the proposed construction or activity showing the significant distances from the proposed construction or activity to the setback line.

(d) If the variance is requested under the provisions of Section 161.052(2)(b), Florida Statutes, or Section 161.053(2)(b), Florida Statutes, the survey shall show the existing structures that are considered to have established the construction line.

(e) Variances requested under the provisions of Section 161.053, Florida Statutes, shall specify the distance and direction from the property in question to the nearest setback line permanent reference monument and the number of that monument.

B. Variance requested which involve proposed construction shall be accompanied by construction plans which provide at least, but are not limited to the following information:

(1) Cross sections of all sub-grade construction or excavation with elevations referenced to 1929 sea level datum, (NGVD).

(2) Elevations of the lowest floor and the first dwelling floor.

(3) Details of all proposed structures or activities which will be seaward of the setback line.

(4) Details and justification for any proposed waste water discharge onto, over, under or across the beach and/or dunes, including but not limited to storm water runoff, swimming pool drainage or air conditioner cooling water discharge.

C. For those counties in which a setback line has been established, under the provisions of Section 161.053, Florida Statutes, there is on file with the Department storm tide data and some data on shoreline stability. For most projects, these data will be sufficient to

satisfy the requirements of Section 161.053(2)(a), Florida Statutes, for such data and such data need not be filed by the applicant. Should the applicant have additional data which he wishes to file, it will be evaluated. On the more complex projects for which variances are requested, additional storm tide and shoreline stability data may be required.

D. The Department may require such additional information as is necessary for proper evaluation of an application.

E. The Department may waive any of the above requirements if in the opinion of the Department such information is not necessary for a proper evaluation of the proposed work or activity.

16B-25.06 Consultation.

The applicant, or his engineer may consult with the Department Staff concerning any construction, expansion, modification, or activity seaward of the SBL, however, any representation by the Department Staff shall not relieve any person of any requirement of the Beach and Shore Preservation Act or Department Rules.

16B-25.07 Processing Procedure.

A. Application will be checked for completeness. If the required information has not been submitted, the Department shall notify the applicant that sufficient information for pocessing is lacking and shall allow a reasonable time for submission of the necessary information.

B. An office review of the proposed work or activity will be made, and if indicated by the nature of the project, a field investigation will be conducted.

C. If the proposed project is acceptable to the Bureau, the applicant will be notified by mail of the recommendation which will be made to the Executive Board of the Department (Governor and Cabinet) and the date, time and place when the recommendation will be heard. The applicant and any interested persons may appear and/or be represented at that time and make their position known to the Executive Board of the Department.

D. If the proposed project is not acceptable to the Bureau, the applicant will be so notified and given an opportunity to modify his plans to make them acceptable.

E. If, for some reason, the applicant cannot, or does not elect to modify his plans, to such an extent that they are acceptable, the Bureau then, upon request of the applicant, will proceed to carry out the procedures as described in C above.

16B-25.08 Variance Conditions.

A. The formal variance will be issued by the Department Staff, upon its approval by the Executive Board of the Department (Governor and Cabinet).

B. By accepting the variance, the applicant agrees to:

(1) Carry out the work or activity for which the variance was granted; in accordance with the plans and specifications filed with the Bureau as a part of his application and approved by the Executive Board of the Department.

(2) Comply with any conditions imposed upon the variance by the Department.

(3) Conduct the work or activity authorized under the variance in such a way as to minimize the adverse impact upon the beach-dune system.

(4) Hold and save the State of Florida, the Department, its officers and employees harmless from any damage to persons or property which might results from the work, activity or structures authorized under the variance.

(5) Furnish to the Department, upon completion of the authorized work, activity or construction, certification by a professional engineer, registered in the State of Florida, that the construction has been completed and that it is acceptable and satisfactory in accordance with the plans and specifications approved by the Department.

16B-25.09 Time Limits on Authorized Variances.

A. The Department may place a reasonable time limit on variances after taking into consideration the complexity of the proposed work or the nature of the activity authorized. Unless otherwise specified, the time limit on variances shall be six (6) months for initiation of construction with completion within eighteen (18) months.

B. The Department will give due consideration to reasonable requests in writing for an extension of the time limit.

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BIOGRAPHICAL SKETCH

Jerry Douglas Belloit was born on May 11, 1951, in Washington, D.C. At an early age his family moved to Jacksonville, Florida, where he attended public school. He graduated from Robert E. Lee High School in 1969.

Mr. Belloit began his college career at Oxford College of Emory University in 1969. In 1971 he transferred to the University of Florida. With a major in psychology, he earned a Bachelor of Science degree in 1974. Following a year of work in industry, he entered the University of Florida College of Business Administration to study real estate. In 1976, he earned a Master of Business Administration degree.

Enjoying his work in the master's program, Mr. Belloit decided to continue his real estate education by working toward his doctorate. During his doctoral program, he engaged in several contract research projects. In 1977 he directed the Lake City Downtown Revitalization Study. In 1978 he was appointed graduate research associate and continued his work for the Real Estate Research Center at the University of Florida.

In September of 1978, Mr. Belloit left the University of Florida to accept a position of assistant professor at Appalachian State University. In his first year he was responsible for the creation of a degree program in real estate and also for the creation of the Real Estate Research Center of the John A. Walker College of Business.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Halbert C. Smith, Jr., Chairman
Professor of Real Estate

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Clayton Curtis
Associate Professor of Real Estate

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the Graduate Faculty of the Department of Finance, Insurance, and Real Estate in the College of Business Administration and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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